

Approved For Release 2002/10/21 : CIA-RDP66B00728R000100130017-7

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11 June 1963

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MEMORANDUM FOR THE RECORD

SUBJECT : R & D Contract at Eastman Kodak

DOCUMENT NO. _____
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☐ DECLASSIFIED
CLASS. CHANGED TO: TS S C 2011
NEXT REVIEW DATE: _____
AUTH: HBJL-2
DATE: 13 JUL 1981 REVIEWER: []

1. A decision was made by the DNRO to consolidate the R & D efforts of E. K. as one contract under the direction of SSD, Gen. Greer. This effort is to be monitored by a CCB system for approving technical directives. The members are:

[] (SSD) Chairman
(NRO)
(CIA)

2. To date, the significant projects submitted by E. K. for approval are as follows:

- a. Frame by Frame Processor: At the present time a processing technique is employed which makes it possible to compensate for incorrect exposure settings in aerial photography. The fundamentals of this technique are, development of the image to the required gamma at a minimum photographic speed in a primary developer, and further development of selected subjects in a secondary developer to attain an optimum density level. Processing machines available to exploit this technique are capable of varying secondary development in increments; however transition from one condition to another involves several frames of exposed material. The present trend toward small scale photography in which scene reflectance or exposure, changes rapidly from frame-to-frame, makes it imperative that equipment become available which has the ability to vary secondary development on a frame-by-frame basis with a transition length no greater than the distance between frames. This is currently directed toward the Stellar/Index Camera and ARGON type operation. It is the purpose of this proposed project to investigate the means by which secondary development may be done on a frame-by-frame basis, design the necessary components to carry out these investigations, and finally to build breadboard equipment to explore ideas evolving from the investigation. [] of a proposed [] was expended on this task prior to the change of contrasting responsibilities.

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b. Automation of I.R. Densitometer: The present I.R. Densitometer on the Trenton Processor is semi-automatic, requiring operator attention to determine areas to be scanned and to carry out the instruction of the scanner. This development will produce apparatus which will automate the entire scanning operation as well as performing action at the command of the scanner output. The apparatus will be primarily electronic control circuits and I.R. detectors added to the present I.R. scanners. A go-ahead was given by CIA on this task, prior to the contract shift to SSD. Total cost estimated at [REDACTED] ✓

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c. Automatic Exposure Control Printer: Present day high speed continuous printers such as the Niagara printer can be manually set to a fixed exposure level but cannot vary the exposure within a single roll. It is proposed to investigate and develop breadboard type apparatus which will exploit the possibilities for automatic control that do not involve dodging or changing the effective curve shape of the print material. This developmental control unit is intended for installation on a continuous contact printer running at constant velocity with exposure controlled by modulation of the printing light source intensity. This proposal was for [REDACTED] and no approval has been given to date.

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d. Scanning and Recording Densitometer: In making quality prints from aerial photography much skilled operator time is required in spot densitometry of selected image areas, and computation of exposure prediction for the printer. We propose to develop a scanning densitometer capable of reading stationary or moving film and equipped with recording devices to aid in the exposure prediction. Successful completion of the development program will provide an engineering model capable of scanning selected areas of 70mm to 9-1/2-inch wide film and of providing graphs of pertinent data for exposure prediction. This proposal was for [REDACTED] and E. K. was given a go-ahead by CIA prior to contract transfer. ✓

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e. Reversal Versatist: A requirement exists in the Photo Interpretation Community for a versatile photographic processing apparatus capable of developing both wide sheets and continuous strips of film to either a reversal or a standard negative image. Change from the reversal to the negative to the reversal processing cycle should be quickly and easily accomplished by turning valves, resetting switches, and changing control set points in a minimum of time. It is

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proposed to redesign existing self threading processing equipment to incorporate the reversal processing cycle in the machine and to incorporate the necessary valves, switches, and control equipment to affect this change. The operating speed of this processor will be approximately twenty inches per minute when used for reversal processing or approximately twenty feet per minute when used for standard negative processing. It will be capable of simultaneously processing two strands of material ranging from nine and one half inches wide down to seventy millimeters wide and three strands of material seventy millimeters wide and narrower. Overall length of the machine will be approximately sixteen feet. This proposal was for [] Due to the initial statement that "a requirement exists in the P. I. Community," this task was sent to NPIC for comments and no action has been taken to date on this subject. It could be accomplished under the NPIC R & D contract with E. K. (See paragraph 3 below). However, I feel there is justification to review this area from an NRO standpoint since potentially such a device could eliminate one step in the basic processing. With a reversal machine, you could go from an original negative to a dupe negative without making the intermediate dupe positive. The CCB will discuss this further.

- f. Evaluation of New Materials and Processes: (Red Dot Tests)
As new and improved films and film-process systems become available it is necessary to evaluate their applicability to specific reconnaissance systems and requirements, and to determine proper exposure, latitude, spectral region, and processing. This task will include the necessary high altitude flight testing, production processing, and analysis required for satisfactory evaluation of the materials. A detailed plan and summary is available in the "General Film Data" file. Emphasis will be placed on exposure determination, color (including high definition color films, conventional color films, and tri-color separation), contrast, and stellar studies. Go-ahead has not been given to date.
- g. Model III Titling: The complexity of the titling problem has steadily increased as formats and operational parameter have become more varied and sophisticated. Recently, titling

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requirements have been defined for the "L" program and are beyond the capability of existing equipment, such as the Dual-Head Titler. It is the purpose of the Model III Titler to develop the necessary hardware (subcontract to Dynametries) and techniques for a more flexible and versatile device. It is proposed to develop movable type titling heads which will permit random, high speed, parallel input. Such a device would allow frame-to-frame title changes in a variable field as well as accomodating the fixed data for each frame. Logic circuitry will be designed to accept input from punched paper tape. Estimated cost is [redacted] I am very much in favor of this device, in fact, suggested that E. K. propose same. So far work is going on, but I don't believe it is fully approved. In their proposal, E. K. failed to give the best justification ... this is for direct support of OXCART. The titler will accept punched paper tape which could come from the OXCART in-flight recorder, thereby automatically giving a frame-by-frame input for latitude and longitude, tip, tilt, etc., as a part of the title.

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3. During the initial discussions with NRO and E. K. on the scope of this R & D effort, it became apparent that the wide grey area between "processing" and "exploitation" needed to be resolved. This was accomplished thru [redacted] of NPIC. He now has [redacted] R & D effort with E. K. for development support leading to improved methods, techniques, and equipment utilized in exploiting information obtained from various programs utilizing photographic sensors. Technical areas of investigation include viewing equipment, projection techniques, color enlarging, data handling, image enhancement, clean room techniques, light sources, and measurement techniques. I feel that by coordination between NPIC and myself we can keep pace with the state-of-the-art in mutual areas of interest.

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4. There are several other areas of effort which I believe should be added to this contract. I expect to propose the following items at the first CCB meeting in Rochester in early July:

- a. Color Processor: E. K. has no color processing equipment in the "black" area. The majority of color processing within the company is either by tray or continuous 35mm equipment. I am rather surprised E. K. has not proposed a continuous, color processing machine. Perhaps it is due to the newness of some of their color emulsions. I feel we should have a capability for processing color in widths up to 9 1/2" with continuous processing machines. I know such machines have been built in the past and that they exist for small film widths. This entire area needs review.

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- b. Latensification: E. K. has proposed in the past to investigate methods of increasing the sensitivity of their fine grain, slow speed emulsions through latensification or other processes. A specific task should be established for this work.
- c. Distortion Free Titling: Current foil stamping devices emboss the area around a letter or number in a title and cause distortion. This is especially critical with cartographic materials, such as ARGON. In fact, one "patio test" was rejected by Autometric due to titling distortions. Also, Autometric developed an ink type titler specifically for ARGON, but they never found a suitable ink that would not wash off or transfer the title to adjacent frames. We now have increased emphasis being placed on dimensional stability of even the panoramic photography, which is used in filling in detail missed by cartographic photography. D.I.A. has stated a requirement for grids or other means of extending geodetic positioning into all aerial photography. Itak has proposed a system of edge lights which can be calibrated to a master grid to recover geometry. The future trend is certainly in this direction, and when titles appear near lights, fiducial marks or other geometric control points, the embossing problem becomes acute. I have discussed this problem with [redacted] (I haven't seen [redacted] since I had the idea) and they feel there must be some dye or ink process which could significantly reduce distortion and still provide some correction (erasure) capability.

5. Before a meaningful meeting can be held, [redacted] will have to be given an IDEALIST and OKCART clearance. He currently has CORONA, ARGON, and T-KH.

SIGNED

DD/OSA

[redacted] DD/OSA mvp (11 June 1963)

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